Correspondence

Date: February 16, 2011

To: Mark Austin (USEPA)
Ken Maas (USACE)

Copy: Ed Dudek (The Louis Berger Group, Inc.)
AmyMarie Accardi-Dey (The Louis Berger Group, Inc.)
F. Chris Purkiss (The Louis Berger Group, Inc.)
Andrew Wolfson (The Louis Berger Group, Inc.)

From: Len Warner (The Louis Berger Group, Inc.)

RE: Bound Brook 2010 Land Survey and Sediment Probing Field Activities
Cornell Dubilier Electronics Site: OU4 Bound Brook
W912DQ-08-D-0017, Task Order 0001

On behalf of the United States Environmental Protection Agency (USEPA) and the United States Army Corps of Engineers (USACE), The Louis Berger Group, Inc. (Berger) is conducting a Remedial Investigation and Feasibility Study (RI/FS) for Bound Brook in Middlesex County (New Jersey), which is defined as Operable Unit 4 to the Cornell Dubilier Electronics Site. For Phase 1 of the RI fieldwork, Berger and their subcontractor (Pennoni Associates, Inc.) conducted land surveying and sediment probing along the main riparian corridor of Bound Brook from the confluence of Bound Brook and Green Brook [river mile (RM) 0] to RM6.9 in Edison, New Jersey (excluding New Market Pond).[1] This memorandum documents these field activities and includes the following documentation (attached):

- Planar view maps of the surface sediment textures of Bound Brook and depth of refusal reported from the sediment probing activities (Figure 1 through Figure 10).
- Compact-disc (CD) containing field photos from the sediment probing work and an electronic database of the sediment probing field data [formatted consistently with USEPA Region 2 Multimedia Electronic Data Deliverable (MEDD) system][2] (Attachment 1).
- Land surveyor field report from Pennoni Associates, Inc. (Attachment 2).

Land surveying and sediment probing activities were conducted consistently with the RI/FS Work Plan and Quality Assurance Project Plan (QAPP) Appendix A: Field Sampling Plan (final version, July 2010).

[1] Data obtained from the bathymetric analysis, side-scan sonar survey, and sediment probing activities in New Market Pond will be discussed in a separate deliverable. Field work of these activities was suspended in December 2010 due to ice formation on the pond.
[2] Draft versions of the MEDD and field photographs were submitted to the USEPA and USACE on January 11, 2011.

SURVEYING TRANSECTS AND POSITIONING SAMPLING LOCATIONS

To guide the field program, the land surveyor placed markers every 500 feet along Bound Brook. (Refer to Attachment 2 for details on establishing the survey control monuments and surveying of markers.) Markers were placed on both sides of the brook forming transects, using orange plastic survey stakes. Each stake was indelibly marked with a survey designation (surveyor numbering system), and generally a label that indicated the project transect designation and the surveyed position.[3] Positioning of sediment probing transects was then based on these markers. Note that since each surveyed transect was spaced 500 feet apart, the four 100-foot spaced probing transects (located between each surveyed transect) were measured manually by the probing field crew using a 100-foot or 300-foot flexible tape measure.

Global positioning system (GPS) readings were recorded at each sampling location with a hand-held Trimble instrument (GeoExplorer Series, Model GEOXH) as a secondary measurement technique; however, placement of sampling locations was based primarily from the surveyed markers. To improve GPS readings, field crews attempted to obtain 30 to 50 positioning readings from the satellites at each location prior to entering the point into the GPS memory. The number of readings depended on the availability of satellites, overhead vegetative cover, or the remaining available battery life in the GPS instrument.[4] Quality assurance checks were also performed regularly by collecting GPS data at one of the land surveyor's stakes. These data were also recorded in the field data sheets.

SEDIMENT PROBING FIELD WORK

On November 15, 2010, a three person crew began sediment probing in Bound Brook at RM0. Field work continued until December 3, 2010, ending at RM6.9. A total of 328 transects were completed with 100-foot spacing between each transect. At most transects, two probing locations were occupied; however, some transects included three probing locations, totaling 659 sediment probes. The most upstream probing location was located at a natural rock outcrop[5], which was designated as the upstream boundary for the probing investigations. During this field program, activities were briefly interrupted due to high river flow and deep water, which lasted for about 1.5 days on (December 1 and 2, 2010).

Once the sediment probing transect was located (whether it was at a surveyed location or one determined by the probing field crew), the approximate brook width was physically measured. This width was recorded in the field notes along with the transect designation number and other pertinent information. The brook width was then divided by three, and the two sediment probing locations were positioned accordingly (*i.e.*, one point at 1/3 the distance across the brook and the second point 2/3 the

---

[3] By the end of the program, all survey markers included a permanent label; however, during the actual field work, the sediment probing field crew team would occasionally observe a marker with a temporary label, since the land surveying and sediment probing activities were occurring at the same time (not sequentially). The sediment probing team was in constant communication with the land surveying team.

[4] Standard Operating Procedure (SOP) No. 6 Section IV.5 requires at a minimum the collection of 3 readings per location. However, the field crew collected between 30 and 50 readings per location to improve the accuracy of the GPS data.

[5] On top of this natural rock outcrop are the cement-remnants of a previous foot bridge. The combination of rubble and rock-outcrop has created a obstruction to flow in Bound Brook. Areas behind this feature are relatively flooded with little surface water flow.

distance), using either a stake, probe rod, or other available temporary markers. Probing and locating the position by GPS immediately followed.

Sediment probing was conducted using an 8-foot long calibrated metal rod (a smooth Electrician's grounding rod was used). Marks were placed along the rod every six inches, to aid the field geologist when estimating the depth and thickness of sediment textures/strata encountered. The rod was also used to determine the water depth at the probing location. Probing was performed by the geologist by penetrating the sediments with the rod, "feeling" whether the rod advanced smoothly through fine-grained sediment or 'scraped' through coarser sediment, while also listening to the sound emitted, if possible. As changes in the texture were encountered, the geologist would verbally relay that information to the person recording the information of the field data sheet. This process continued until refusal was met, unless water depth, thickness of the sediment bed, or both combined was greater than the length of the 8-foot long probe rod. In deep water, an extension pole was attached to the probe rod to permit probing of the sediments from a boat. Note that one set of probing data were collected at each location. This field adjustment differs from SOP No. 7 Section III.5, which states that probing at a given location should be repeated three or more times. After communication with the project manager, this repetition was removed to maintain the field schedule.

CONFIRMATORY CORING FIELD WORK

A confirmatory sediment core was collected at approximately every tenth probing location following SOP No. 8: Procedure to Collect Push and Piston Cores. A total of 58 confirmatory cores were collected.[6] As discussed in the Field Sampling Plan, confirmatory coring is a quality assurance method to allow the geologist to physically see and classify the sediments and then associate this information with what was "felt" and heard while using the probe rod. The confirmatory core was not collected until after the geologist performed the sediment probing at the specific location. Most often the core was collected using a 2-inch diameter, 4-foot long Lexan tube by driving it into the sediment bed with a rubber mallet. An 8-foot long Lexan tube was used when necessary to collect the confirmatory core from deeper sediments or at locations in deeper water. Note that confirmatory cores were penetrated to refusal, except at locations where the combined water depth and sediment refusal depth was greater than 8 feet in total length.

Once the Lexan core tube was driven into the sediment bed (either encountering refusal or when the top of the tube reached the water surface), the tube was filled with water, capped, and then pulled from the river bottom. At a number of locations, a piston was installed (using a rubber stopper on a rope) prior to driving the core tube, creating a vacuum to improve, if possible, the total recovery length. After pulling the core from the brook, the sediments were visually inspected, measured, and compared to the total penetration depth. The sediments were then released from the core tube onto plastic sheeting for inspection and classification by the geologist following SOP No 10: Classification of Soil and Sediment. A Munsell Color Chart was used for assigning a color designation to the sample. Field data sheets were

[6] When hard bottom was encountered in the field, no confirmatory core was collected because the penetration depth equals zero.

completed, documenting the necessary field information for each probing location. Record samples were placed in jars and are retained on-site for future review, if needed.

MAPPING FIELD DATA IN THE OFFICE

Following the field effort, geological sediment probing and confirmatory coring data were digitized and compiled into an electronic database that was formatted consistently with the USEPA Region 2 MEDD format. GPS coordinates were then downloaded to ArcGIS software and compared to the field notes. Where necessary, GPS sampling locations (which were considered secondary measurement points) were adjusted to be consistent with the surveyed transect locations and field measurements. The field crew was consulted regarding all potentially mis-projected points and location adjustments since some probing locations and transect spacing had to be adjusted in the field due to deep water and the presence of utilities, debris, or other structures. Mis-projected data that required adjustment included points located outside the shoreline (*i.e.,* located on land), transect points positioned with direction of flow (instead of perpendicular to flow), inaccurate spacing between transects or sample locations, or points that did not have a corresponding field recorded GPS reading.[7] The final set of GPS coordinates were incorporated into the MEDD database. Data from the MEDD were then mapped to develop a surface sediment texture map and a depth of refusal sediments map.

A summary of GPS mis-projections and shoreline adjustments encountered during the data compilation and mapping are presented below.

- The shoreline for Bound Brook was provided by Tetra Tech, Inc. as a GIS shapefile. However, since no metadata was provided with this shoreline file, information regarding how the extent of the brook was delineated is not available.
- The shoreline shapefile was not continuous, with breaks in the shoreline when bridges and over-passes were encountered.
- In some areas of Bound Brook, the bank-to-bank width of the brook in the shapefile did not match the river width manually measured by the field crew.
- For the purpose of this mapping, the shoreline shapefile provided by Tetra Tech, Inc. was adjusted to be consistent with information collected in the field during probing, aerial imagery provided by Penoni Associates, Inc., and 2002 aerial imagery from the New Jersey Office of Information Technology (Office of GIS).

Of the 659 sediment probing locations that were sampled, 337 locations were manually adjusted in GIS. These locations are identified as "Coordinates Adjusted to be Consistent with Field Notes" in the attached sediment probing figures. Table 1 (below) provides the statistics of the horizontal error (*i.e*., distance between original GPS reading and the adjusted location) associated with the manually adjusted points. On average, the sediment probing locations had to be adjusted by 9 feet. Note that this average horizontal error is in-line with differences observed during the quality control check of the GPS

[7] Tree cover and bridge structures prevented the GPS from receiving a satellite signal and no field recorded GPS reading was possible.

instrument. At the 15 quality control locations, the largest distance error between the GPS reading and the surveyed marker was 10.5 feet.

Table1. Statistics on the Distance Between Original GPS Reading and the Adjusted Location (feet)

Statistics	All of Bound Brook (RM0-RM7)	Per River Mile along Bound Brook						
		RM 0-1	RM 1-2	RM 2-3	RM 3-4	RM 4-5	RM 5-6	RM 6-7
Average Adjusted Distance	**9**	10.3	9.2	9.0	6.8	8.7	9.2	6.7
Minimum Distance	**0.4**	0.7	1.1	0.6	0.9	2.8	0.4	1.5
Maximum Distance	**50**	50	46	36	12	23	35	25
Standard Deviation	**7**	8.6	7.4	8.2	3.1	5.0	6.3	4.5
Number of Adjusted Points	**337**	64	47	52	25	25	85	39

Using the final coordinate dataset and adjusted shoreline, Bound Brook was divided into Thiessen Polygons using a tool available in ArcGIS. Thiessen polygons are mathematically-generated polygons whose boundaries define the “area of influence” of each data point. The “area of influence” is mathematically defined by the perpendicular bisectors of the lines between all points. Each polygon contains one data point. The extent of the “area of influence” was limited to the extent of the adjusted shoreline. Professional judgment was used to identify areas where the sampled data were not representative of the field measurement. These areas included bends along the river, inlets, and data gap areas.

Figures 1 through 10 present Bound Brook and the Thiessen polygons “areas of influence.” In the top panel (Panel A), the polygon is populated with the surface sediment texture from each probing location. (When a sediment probe and confirmatory core were collected from the same location, geological data from the confirmatory core was presented.) For the purpose of this interpolation, the primary sediment texture classified by the geologist is presented. The bottom panel (Panel B) presents the corresponding depth of refusal during probing.

If you have any further questions on these field activities, feel free to contact me at 914-798-3721. We anticipate using these data to plan the spring 2011 field program, which includes collection of low resolution sediment cores and geotechnical borings.

Attachments:

Figure 1 through Figure 10: Sediment Probing Interpretation
Attachment 1: CD containing USEPA Region 2 MEDD deliverable and field photographs
Attachment 2: Pennoni Associate, Inc. Land Survey Field Report